0831106 Rev.0

Calibration procedure

MKP
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INSTRUMENT CALIBRATION PROCEDURES

1 GENERAL GUIDELINES FOR CALIBRATION

For an accurate calibration it is necessary to proceed as follows:
a) - The instrument under calibration should be mounted in its case in order to keep the internal temperature stable.
b) - The ambient temperature should be stable. Avoid any drift due to air-conditioning or others.
c) - The relative humidity should not exceed 70%.
d) - The instrument must be in ON condition from 20 minutes at least.
e) - Operate, possibly, in an environment with no electromagnetic disturbances.
f) - During calibration, connect to the instrument one input at a time.
g) - Before to execute each calibration, be sure that the specific hardware setting has been made (see "Preliminary hardware setting" paragraph).

For this calibration procedure it is necessary to use calibrators with the following accuracy and resolution:

ACCURACY
1) For current input: ± 0.025% output ± 0.0025% range ± 0.01 µA
2) For voltage input : + 0.005% output + 0.001% range + 5 µV
3) For TC input: + 0.005% output + 0.001% range + 5 µV
4) For RTD input: ± 0.02 % ± 0.0025 Ω/decade.
5) For cold junction compensation: better than 0.1 °C

RESOLUTION
1) For current input: 0.5 µA
2) For voltage input: 100 µV
3) For TC input: 1 µV
4) For RTD input: 10 mΩ
5) For cold junction compensation: better than 0.1 °C

2 PRELIMINARY HARDWARE SETTINGS

2.1 HOW TO REMOVE THE INSTRUMENT FROM ITS CASE

1) Switch off the instrument.
2) Push gently the lock A on the right.
3) While the lock A is maintained out, slide out the right side of the instrument (see fig. 1).

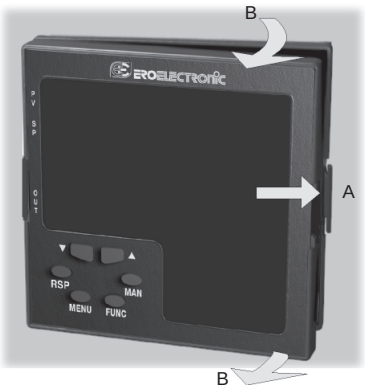

Fig. 1

4) Push gently the lock C on the left.
5) While the lock C is maintained out, slide out the instrument (see fig. 2).

Fig. 2

2.2 MAIN INPUT SELECTION

Set J103 (see fig. 3) according to the desired input type as shown in the following table.

J103	INPUT TYPE				
	T/C, RTD,CJ	60 mV	5 V	10 V	20 mA
1-2	open	open	close	open	open
3-4	open	open	close	close	open
5-6	open	open	open	open	close
7-8	open	open	open	open	close
5-7	close	close	open	close	open
6-8	close	close	open	open	open

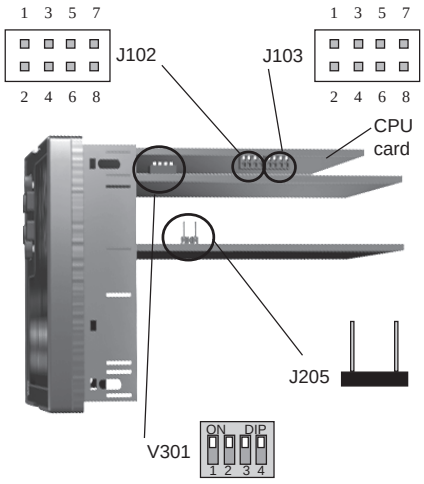

Fig. 3

2.3 AUXILIARY INPUT SELECTION (option)

Set J102 (see fig. 3) according to the desired input type as shown in the following table.

J102	INPUT TYPE		
	5 V	10 V	20 mA
1-2	close	open	open
3-4	close	close	open
5-6	open	open	close
7-8	open	open	close
5-7	open	close	open
6-8	open	open	open

2.4 IN CT / FEEDBACK SELECTION

This instrument can use the "IN CT" input or the "Feedback" input; the two inputs are not contemporarily.
The current transformer input allows you to measure and display the current running in a load driven by a time proportional control output during the ON and OFF periods of the output cycle time. By this feature it is also available the "Out failure detection" function (see page 66 in the USER MANUAL).
The feedback input is used when the servomotor close loop or the servomotor open loop with valve position indication outputs is required.
To select the desired input type, set V301 (see fig. 3) as detailed in the following table:

Input	V301.1	V301.2	V301.3	V301.4
IN CT	ON	OFF	ON	ON
Feedback	OFF	ON	OFF	ON

2.5 CALIBRATION MODE SELECTION

To start the calibration procedure, the DIP SWITCH V101, mounted on CPU card, must be set as follows:
V101.1 = Not care condition
V101.2 = OFF
V101.3 = Not care condition
V101.4 = ON
NOTE: during calibration procedure the serial communication interface will be disabled.

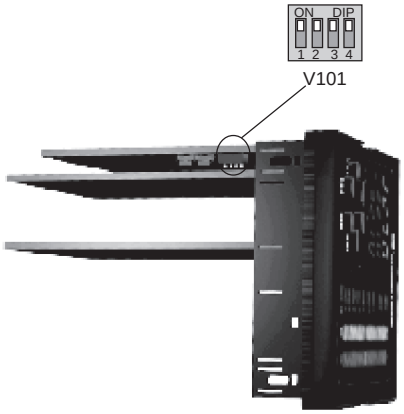

Fig. 4

When it is desired to exit from calibration mode proceed as follows:
1) switch off the instrument;
2) remove the instrument from its case;
3) select the desired operative mode by setting the DIP switch V101 as described in "Operative mode and hardware lock" paragraph reported at page 23 of the USER MANUAL.

3 CALIBRATION PROCEDURE

3.1 FOREWORD

Calibration parameters are divided in groups.
Each group is comprised of two parameters (initial and full scale values) plus a specific calibration check.

Follows a complete list of the "calibrations groups".

1) ñ.I.tc = Main input calibration, TC input
2) ñ.I.CJ = Main input calibration, cold junction
3) ñ.I.rt = Main input calibration, RTD input
4) ñ.I.ñA = Main input calibration, mA input
5) ñ.I.5 = Main input calibration, 5 V input
6) ñ.I.10 = Main input calibration, 10 V input
7) A.I.ñA = Auxiliary input calibration, mA input
8) A.I.5 = Auxiliary input calibration, 5 V input
9) A.I.10 = Auxiliary input calibration, 10 V input
10) In.Ct = Current transformer input calibration
11) FEEd = Feedback input
12) 05.ñA = Out 5 calibration
13) 06.ñA = Out 6 calibration
14) CAL = Default calibration data loading

NOTE: Calibration groups from group 7 to group 13 will be shown only when the specific hardware is fitted.

GENERAL NOTE ABOUT CALIBRATION PROCEDURE:
During calibration procedure, when the initial or full scale value of a group is selected and the middle display shows "OFF", pushing the FUNC pushbutton the instrument will jump to the next parameter or check **without to modify** the previous calibration setting.
In this way it is possible to recalibrate only the desired input or output.
It is also possibe to make a check of one or more calibration group without to remake the specific calibration.

3.2 CALIBRATION PROCEDURE

HOW TO PROCEED
Switch on the instrument, the upper display will show CAL while the lower display will show the firmware version.
Push the FUNC pushbutton to display the first calibration group on the upper display. Depress FUNC pushbutton more times until the desired calibration group is reached.

1) "ñ.I.tc" - MAIN INPUT CALIBRATION - TC INPUT
The upper display will show "ñ.I.tc".

1.1) "Lr" - INITIAL SCALE VALUE
The lower display will show "Lr"

a) Made the specific hardware setting as described at paragraph 2.
b) Connect the instrument under test to the calibrator as shown in Fig. 5.

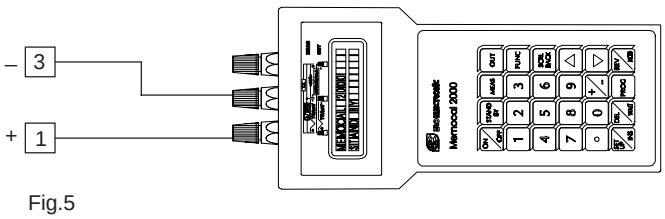

Fig.5

c) The upper display will show "ñ.I.tc", the lower display will show "Lr" while "OFF" will appear on the middle display.
d) Set calibrator to 0.000 mV.
e) Push ▲ pushbutton, the middle display will change to "On".
f) After few seconds, start calibration by pushing FUNC pushbutton. At the end of this calibration routine, the instrument will go to the next step.

1.2) "Hr" - FINAL SCALE VALUE

The upper display will show "ñ.I.tc", the lower display will show "Hr" while "OFF" will appear on the middle display.

a) Set the calibrator to 60.000 mV (see Fig. 5).
b) Push ▲ pushbutton, the middle display will change to "On".
c) After few seconds, start calibration by pushing FUNC pushbutton. At the end of this calibration routine, the instrument will go to the next step.

1.3) "∀." - TC INPUT CHECK

The lower and the middle display show "∀." followed by the measured value in counts as shown in the following figure:

Fig. 6

The "ñ.I.tc" "Hr" calibration is correct if the indication is equal to "∀. 3 0000" ± 10 counts.

a) Check the zero calibration, by setting the calibrator to 0.000 mV, the read-out must be equal to "∀. 0 0000" ± 10 counts.
b) Check the half scale linearity by setting the calibrator to 30.000 mV. The read-out must be "∀. 1 5000" ± 10 counts.
NOTE: when it is desired to use a different check point, the following formula describes the ratio between the signal input and the instrument read-out (in counts).

$$\text{Instrument readout (in counts)} = \frac{\text{input value}}{60\ (\text{mV})} \bullet 30000$$

c) Push FUNC pushbutton, the instrument will go to the next calibration group.

2) "ñ.I.CJ" - MAIN INPUT CALIBRATION - COLD JUNCTION

The upper display will show "ñ.I.CJ"

NOTE: make sure that "ñ.I.tc" "Lr" and "ñ.I.tc" "Hr" parameters are correctly calibrated before to calibrate "ñ.I.CJ" parameter.

2.1) Lr - ACTUAL VALUE

The lower display will show "Lr"

a) Made the specific hardware setting as described at paragraph 2.
b) Measure the temperature close to terminals 1 and 3 using a calibrator, for instance, the MEMOCAL (see Fig. 7).

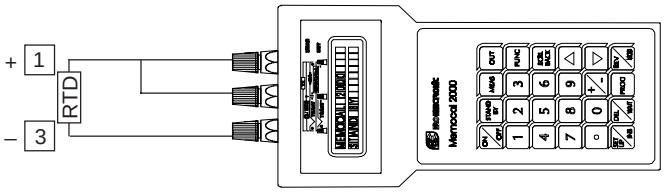

Fig. 7

c) Wait a few minutes to allow the temperature stabilisation of the entire system (sensor, calibrator and instrument).
d) The middle displays will show "OFF". At the first pressure of ▲ or ▼ push-button, the middle display starts to show a read-out value.
e) Using ▲ or ▼ push-button, set a read-out value equal to the temperature measured by the measuring device (in C° and tenths of °C).
f) After a few seconds, start the calibration by pushing FUNC pushbutton. At the end of this calibration routine, the instrument will go to the next step.

2.2) "∀." - COLD JUNCTION COMPENSATION CHECK

The middle display will show "∀.".
The lower display will show the measured cold junction temperature (in C° and tenths of °C).

a) Make sure that the cold junction temperature measured by the instrument is equal to the value measured by the measuring device (MEMOCAL).
b) Push FUNC pushbutton, the instrument will go to the next calibration group.

3) "ñ.I.rt" - MAIN INPUT CALIBRATION - RTD INPUT

The upper display will show "ñ.I.rt".

NOTE: make sure that "ñ.I.tc" "Lr", "ñ.I.tc" "Hr" and "ñ.I.CJ" parameters are correctly calibrated before to calibrate "ñ.I.rt" parameter.

3.1) "Lr" - INITIAL SCALE VALUE

The lower display will show "Lr"

a) Made the specific hardware setting as described at paragraph 2.
b) Made a short circuit between terminals 1, 3 and 4 as shown in Fig. 8.

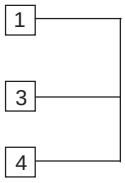

Fig.8

c) The upper display will show "ñ.I.rt", the lower display will show "Lr" while "OFF" will appear on the middle display.
d) Push ▲ pushbutton, the middle display will change to "On".
e) After a few seconds, start the calibration by pushing FUNC pushbutton. At the end of this calibration routine, the instrument will go to the next step.

3.2) "Hr" - FINAL SCALE VALUE

The upper display will show "ñ.I.rt", the lower display will show "Hr" while "OFF" will appear on the middle display.

a) Connect the instrument under test to the calibrator as shown in Fig. 9.

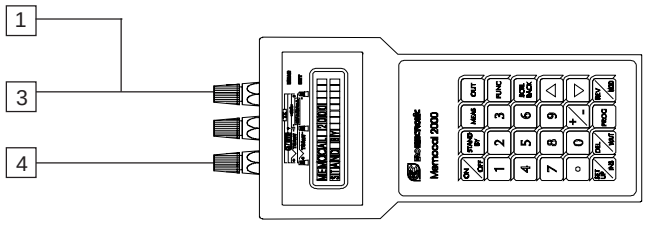

Fig.9

b) Set the calibrator to 375.00 Ω.
c) Push ▲ pushbutton, the middle display will change to "On".
d) After a few seconds, start the calibration by pushing FUNC pushbutton. At the end of this calibration routine, the instrument will go to the next step.

3.3) "∀." - RTD INPUT CHECK

The lower and the middle display show "∀." followed by the measured value in counts (see fig 6).

The "ñ.I.rt" "Hr" calibration is correct if the indication is equal to "∀. 3 0000" ± 10 counts.

a) Check the zero calibration, by setting the calibrator to 0.00 Ω, the read-out must be equal to "∀. 0 0000" ± 10 counts.
b) Check the linearity by setting the calibrator to 175.00 Ω. The read-out must be "∀. 1 4213" ± 10 counts.

c) Set the calibrator to 275.00 Ω. The read-out must be "∀. 2 2166" ± 10 counts.
d) Push FUNC pushbutton, the instrument will go to the next calibration group.

4) "ñ.I.ñA" - MAIN INPUT CALIBRATION - mA INPUT
The upper display will show "ñ.I.ñA".

4.1) "Lr" - INITIAL SCALE VALUE
The lower display will show "Lr"
a) Made the specific hardware setting as described at paragraph 2.
b) Connect the instrument under test to the calibrator as shown in Fig. 10.

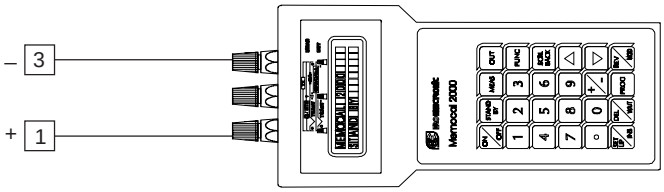

Fig.10

c) The upper display will show "ñ.I.ñA", the lower display will show "Lr" while "OFF" will appear on the middle display.
d) Set calibrator to 0.000 mA.
e) Push ▲ pushbutton, the middle display will change to "On".
f) After a few seconds, start the calibration by pushing FUNC pushbutton. At the end of this calibration routine, the instrument will go to the next step.

4.2) "Hr" - FINAL SCALE VALUE
The upper display will show "ñ.I.ñA", the lower display will show "Hr" while "OFF" will appear on the middle display.
a) Set the calibrator to 20.000 mA.
b) Push ▲ pushbutton, the middle display will change to "On".
d) After a few seconds, start the calibration by pushing FUNC pushbutton. At the end of this calibration routine, the instrument will go to the next step.

4.3) "∀." - mA INPUT CHECK
The lower and the middle display show "∀." followed by the measured value in counts (see fig 6).

The "ñ.I.ñA" "Hr" calibration is correct if the indication is equal to "∀. 3 0000" ± 10 counts.
a) Check the zero calibration, by setting the calibrator to 0.000 mA, the read-out must be equal to "∀. 0 0000" ± 10 counts.
b) Check the linearity by setting the calibrator to 10.000 mA The read-out must be "∀. 1 5000" ± 10 counts.
NOTE: when it is desired to use a different check point, the following formula describes the ratio between the signal input and the instrument read-out (in counts).

$$\text{Instrument readout (in counts)} = \frac{\text{input value}}{20\ (\text{mA})} \bullet 30000$$

c) Push FUNC pushbutton, the instrument will go to the next calibration group.

5) "ñ.I.5" - MAIN INPUT CALIBRATION - 5 V INPUT
The upper display will show "ñ.I.5".

5.1) "Lr" - INITIAL SCALE VALUE
The lower display will show "Lr"
a) Made the specific hardware setting as described at paragraph 2.
b) Connect the instrument under test to the calibrator as shown in Fig. 5.
c) The upper display will show "ñ.I.5", the lower display will show "Lr" while "OFF" will appear on the middle display.
d) Set calibrator to 0.000 V.
e) Push ▲ pushbutton, the middle display will change to "On".
f) After a few seconds, start the calibration by pushing FUNC pushbutton. At the end of this calibration routine, the instrument will go to the next step.

5.2) "Hr" - FINAL SCALE VALUE
The upper display will show "ñ.I.5", the lower display will show "Hr" while "OFF" will appear on the middle display.
a) Set the calibrator to 5.000 V.
b) Push ▲ pushbutton, the middle display will change to "On".
d) After a few seconds, start the calibration by pushing FUNC pushbutton. At the end of this calibration routine, the instrument will go to the next step.

5.3) "∀." - 5 V INPUT CHECK
The lower and the middle display show "∀." followed by the measured value in counts (see fig 6).

The "ñ.I.5" "Hr" calibration is correct if the indication is equal to "∀. 3 0000" ± 10 counts.
a) Check the zero calibration, by setting the calibrator to 0.0000 V, the read-out must be equal to "∀. 0 0000" ± 10 counts.
b) Check the linearity by setting the calibrator to 2.500 V The read-out must be "∀. 1 5000" ± 10 counts.
NOTE: when it is desired to use a different check point, the following formula describes the ratio between the signal input and the instrument read-out (in counts).

$$\text{Instrument readout (in counts)} = \frac{\text{input value}}{5\ (\text{V})} \bullet 30000$$

c) Push FUNC pushbutton, the instrument will go to the next calibration group.

6) "ñ.I.10" - MAIN INPUT CALIBRATION - 10 V INPUT
The upper display will show "ñ.I.10".

6.1) "Lr" - INITIAL SCALE VALUE
The lower display will show "Lr"
a) Made the specific hardware setting as described at paragraph 2.
b) Connect the instrument under test to the calibrator as shown in Fig. 5.
c) The upper display will show "ñ.I.10", the lower display will show "Lr" while "OFF" will appear on the middle display.
d) Set calibrator to 0.000 V.
e) Push ▲ pushbutton, the middle display will change to "On".
f) After a few seconds, start the calibration by pushing FUNC pushbutton. At the end of this calibration routine, the instrument will go to the next step.

6.2) "Hr" - FINAL SCALE VALUE
The upper display will show "ñ.I.10", the lower display will show "Hr" while "OFF" will appear on the middle display.
a) Set the calibrator to 10.000 V.
b) Push ▲ pushbutton, the middle display will change to "On".
c) After a few seconds, start the calibration by pushing FUNC pushbutton. At the end of this calibration routine, the instrument will go to the next step.

6.3) "∀." - 10 V INPUT CHECK
The lower and the middle display show "∀." followed by the measured value in counts (see fig 6).

The "ñ.I.10" "Hr" calibration is correct if the indication is equal to "∀. 3 0000" ± 10 counts.
a) Check the zero calibration, by setting the calibrator to 0.000 V, the read-out must be equal to "∀. 0 0000" ± 10 counts.
b) Check the linearity by setting the calibrator to 5.000 V The read-out must be "∀. 1 5000" ± 10 counts.
NOTE: when it is desired to use a different check point, the following formula describes the ratio between the signal input and

the instrument read-out (in counts).

$$\text{Instrument readout (in counts)} = \frac{\text{input value}}{10\ (V)} \bullet 30000$$

c) Push FUNC pushbutton, the instrument will go to the next calibration group.

7) "A.I.ñA" - AUXILIARY INPUT CALIBRATION - mA INPUT

The upper display will show "A.I.ñA".

7.1) "Lr" - INITIAL SCALE VALUE

The lower display will show "Lr"

a) Made the specific hardware setting as described at paragraph 2.
b) Connect the instrument under test to the calibrator as shown in Fig. 11.

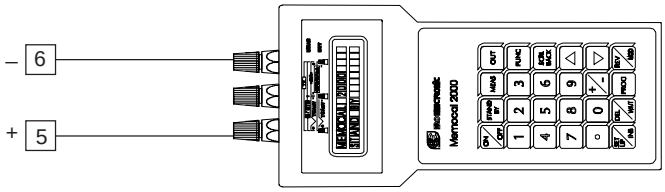

Fig.11

c) The upper display will show "A.I.ñA", the lower display will show "Lr" while "OFF" will appear on the middle display.
d) Set calibrator to 0.000 mA.
e) Push ▲ pushbutton, the middle display will change to "On".
f) After a few seconds, start the calibration by pushing FUNC pushbutton. At the end of this calibration routine, the instrument will go to the next step.

7.2) "Hr" - FINAL SCALE VALUE

The upper display will show "A.I.ñA", the lower display will show "Hr" while "OFF" will appear on the middle display.

a) Set the calibrator to 20.000 mA.
b) Push ▲ pushbutton, the middle display will change to "On".
d) After a few seconds, start the calibration by pushing FUNC pushbutton. At the end of this calibration routine, the instrument will go to the next step.

7.3) "∀." - mA AUXILIARY INPUT CHECK

The lower and the middle display show "∀." followed by the measured value in counts (see fig 6).

The "A.I.ñA" "Hr" calibration is correct if the indication is equal to "∀. 3 0000" ± 10 counts.

a) Check the zero calibration, by setting the calibrator to 0.000 mA, the read-out must be equal to "∀. 0 0000" ± 10 counts.
b) Check the linearity by setting the calibrator to 10.000 mA The read-out must be "∀. 1 5000" ± 10 counts.
NOTE: when it is desired to use a different check point, the following formula describes the ratio between the signal input and the instrument read-out (in counts).

$$\text{Instrument readout (in counts)} = \frac{\text{input value}}{20\ (mA)} \bullet 30000$$

c) Push FUNC pushbutton, the instrument will go to the next calibration group.

8) "A.I.5" - AUXILIARY INPUT CALIBRATION - 5 V INPUT

The upper display will show "A.I.5".

8.1) "Lr" - INITIAL SCALE VALUE

The lower display will show "Lr"

a) Made the specific hardware setting as described at paragraph 2.
b) Connect the instrument under test to the calibrator as shown in Fig. 12.

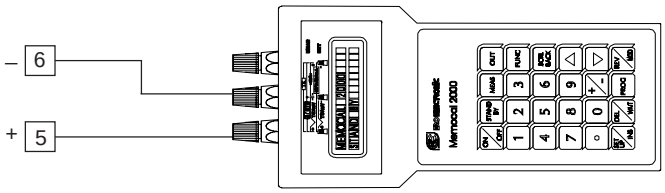

Fig.12

c) The upper display will show "A.I.5", the lower display will show "Lr" while "OFF" will appear on the middle display.
d) Set calibrator to 0.000 V.
e) Push ▲ pushbutton, the middle display will change to "On".
f) After a few seconds, start the calibration by pushing FUNC pushbutton. At the end of this calibration routine, the instrument will go to the next step.

8.2) "Hr" - FINAL SCALE VALUE

The upper display will show "A.I.5", the lower display will show "Hr" while "OFF" will appear on the middle display.

a) Set the calibrator to 5.000 V.
b) Push ▲ pushbutton, the middle display will change to "On".
d) After a few seconds, start the calibration by pushing FUNC pushbutton. At the end of this calibration routine, the instrument will go to the next step.

8.3) "∀." - 5 V AUXILIARY INPUT CHECK

The lower and the middle display show "∀." followed by the measured value in counts (see fig 6).

The "A.I.5" "Hr" calibration is correct if the indication is equal to "∀. 3 0000" ± 10 counts.

a) Check the zero calibration, by setting the calibrator to 0.0000 V, the read-out must be equal to "∀. 0 0000" ± 10 counts.
b) Check the linearity by setting the calibrator to 2.500 V The read-out must be "∀. 1 5000" ± 10 counts.
NOTE: when it is desired to use a different check point, the following formula describes the ratio between the signal input and the instrument read-out (in counts).

$$\text{Instrument readout (in counts)} = \frac{\text{input value}}{5\ (V)} \bullet 30000$$

c) Push FUNC pushbutton, the instrument will go to the next calibration group.

9) "A.I.10" - AUXILIARY INPUT CALIBRATION - 10 V INPUT

The upper display will show "A.I.10".

9.1) "Lr" - INITIAL SCALE VALUE

The lower display will show "Lr"

a) Made the specific hardware setting as described at paragraph 2.
b) Connect the instrument under test to the calibrator as shown in Fig. 12.
c) The upper display will show "A.I.10", the lower display will show "Lr" while "OFF" will appear on the middle display.
d) Set calibrator to 0.000 V.
e) Push ▲ pushbutton, the middle display will change to "On".
f) After a few seconds, start the calibration by pushing FUNC pushbutton. At the end of this calibration routine, the instrument will go to the next step.

9.2) "Hr" - FINAL SCALE VALUE

The upper display will show "A.I.10", the lower display will show "Hr" while "OFF" will appear on the middle display.

a) Set the calibrator to 10.000 V.
b) Push ▲ pushbutton, the middle display will change to "On".
d) After a few seconds, start the calibration by pushing FUNC pushbutton. At the end of this calibration routine, the instrument will go to the next step.

9.3) "∀." - 10 V AUXILIARY INPUT CHECK

The lower and the middle display show "∀." followed by the measured value in counts (see fig 6).

The "A.I.10" "Hr" calibration is correct if the indication is equal to "∀. 3 0000" ± 10 counts.

a) Check the zero calibration, by setting the calibrator to 0.000 V, the read-out must be equal to "∀. 0 0000" ± 10 counts.

b) Check the linearity by setting the calibrator to 5.000 V The read-out must be "∀. 1 5000" ± 10 counts.

NOTE: when it is desired to use a different check point, the following formula describes the ratio between the signal input and the instrument read-out (in counts).

$$\text{Instrument readout (in counts)} = \frac{\text{input value}}{10\ (\text{V})} \bullet 30000$$

c) Push FUNC pushbutton, the instrument will go to the next calibration group.

10) "In.Ct" - CURRENT TRANSFORMER INPUT CALIBRATION

The upper display will show "In.Ct".

10.1) "Lr" - INITIAL SCALE VALUE

The lower display will show "Lr"

a) Made the specific hardware setting as described at paragraph 2.

b) Connect the instrument under test to the calibrator as shown in Fig. 13.

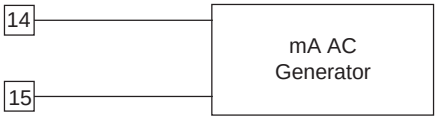

Fig.13

c) The upper display will show "In.Ct", the lower display will show "Lr" while "OFF" will appear on the middle display.

d) Set calibrator to 0.00 mA AC.

e) Push ▲ pushbutton, the middle display will change to "On".

f) After a few seconds, start the calibration by pushing FUNC pushbutton. At the end of this calibration routine, the instrument will go to the next step.

10.2) "Hr" - FINAL SCALE VALUE

The upper display will show "In.Ct", the lower display will show "Hr" while "OFF" will appear on the middle display.

a) Set the calibrator to 50.00 mA AC.

b) Push ▲ pushbutton, the middle display will change to "On".

d) After a few seconds, start the calibration by pushing FUNC pushbutton. At the end of this calibration routine, the instrument will go to the next step.

10.3) "∀." - CURRENT TRANSFORMER INPUT CHECK

The lower and the middle display show "∀." followed by the measured value in counts (see fig 6).

The "In.Ct" "Hr" calibration is correct if the indication is equal to "∀. 0 1000" ± 10 counts.

a) Check the zero calibration, by setting the calibrator to 0.00 mA AC, the read-out must be equal to "∀. 0 0000" ± 10 counts.

b) Check the linearity by setting the calibrator to 25.00 mA AC. The read-out must be "∀. 0 0500" ± 10 counts.

NOTE: when it is desired to use a different check point, the following formula describes the ratio between the signal input and the instrument read-out (in counts).

$$\text{Instrument readout (in counts)} = \frac{\text{input value}}{50\ (\text{mA AC})} \bullet 1000$$

c) Push FUNC pushbutton, the instrument will go to the next calibration group.

11) "FEEd" - FEEDBACK INPUT CALIBRATION

The upper display will show "FEEd".

11.1) "Lr" - INITIAL SCALE VALUE

The lower display will show "Lr"

a) Made the specific hardware setting as described at paragraph 2.

b) Two resistors (1 KΩ, 1/4 W, 1%) must be connected to the instrument under test as shown in Fig. 14.

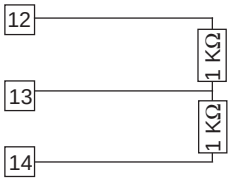

Fig.14

c) The upper display will show "FEEd", the lower display will show "Lr" while "OFF" will appear on the middle display.

d) Made a short circuit between terminal 13 and 14.

e) Push ▲ push-button, the middle display will change to "On".

f) After a few seconds, start the calibration by pushing FUNC push-button. At the end of this calibration routine, the instrument will go to the next step.

11.2) "Hr" - FINAL SCALE VALUE

c) The upper display will show "FEEd", the lower display will show "Hr" while "OFF" will appear on the middle display.

a) Remove the short circuit between terminal 13 and 14. Made a short circuit between terminal 12 and 13.

b) Push ▲ push-button, the middle display will change to "ON".

d) After a few seconds, start the calibration by pushing FUNC push-button. At the end of this calibration routine, the instrument will go to the next step.

11.3) "∀." - FEEDBACK INPUT CHECK

The lower and the middle display show "∀." followed by the measured value in counts (see fig 6).

The "FEEd" "Hr" calibration is correct if the indication is equal to "∀. 0 1000" ± 10 counts.

a) Check the zero calibration, by removing the short circuit between terminal 12 and 13 and making a short circuit between terminal 13 and 14; the read-out must be equal to "∀. 0 0000" ± 10 counts.

b) Push FUNC push-button, the instrument will go to the next calibration group.

12) "O5.ñA" - OUT 5 CALIBRATION.

The upper display will show "O5.ñA".

12.1) "Lr" - INITIAL SCALE VALUE

a) Connect the instrument under test to the calibrator as shown in Fig. 15.

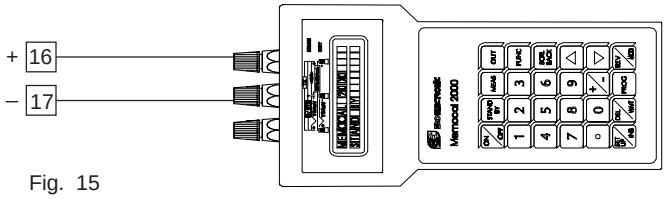

Fig. 15

b) The upper display will show "O5.ñA", the lower display will show "Lr" while the middle display will show the actual zero offset in counts (a number from 0 to 5000).

c) Using ▲ or ▼ push-button, adjust the instrument output until 0.000 mA ±0.005 mA is shown by the calibrator.

d) After a few seconds, start the calibration by pushing FUNC push-button. At the end of this calibration routine, the instrument will go to the next step.

12.2) "Hr" - FINAL SCALE VALUE

The upper display will show "O5.ñA", the lower display will show "Hr" while the middle display will show the actual full scale offset in counts (a number from 0 to 5000).

a) Using ▲ or ▼ push-button, adjust the instrument output until 20.000 mA ±0.005 mA is shown by the calibrator.

b) After a few seconds, start the calibration by pushing FUNC push-button. At the end of this calibration routine, the instrument will go to the next step.

12.3) "∀." - OUT 5 CHECK

The upper display will show "O5.ñA", the lower display will show "∀." while the middle display will show a read-out value in counts (a number from 0 to 8000).

a) The instrument shows a value equal to 4000 count. The calibrator measure must be equal to 10.000 mA ± 0.005 mA

NOTE: when it is desired to use a different check point, the following formula describes the ratio between the signal output and the instrument read-out (in counts).

$$\text{OUT} = \frac{\text{displayed value}}{8000} \bullet 20$$

b) Using ▲ or ▼ push-button, set a value equal to 0 count. The "O5.ñA" "Lr" calibration is correct if the calibrator measure an output equal to 0.000 mA ± 0.005 mA

c) Using ▲ or ▼ push-button, set a value equal to 8000 count. The "O5.ñA" "Hr" calibration is correct if the calibrator measure an output equal to 20.000 mA ± 0.005 mA

d) Push FUNC push-button, the instrument will go to the next calibration group.

13) "O6.ñA" - OUT 6 CALIBRATION.

The upper display will show "O6.ñA".

13.1) "Lr" - INITIAL SCALE VALUE

a) Connect the instrument under test to the calibrator as shown in Fig. 15.

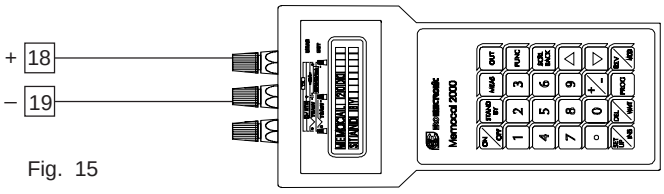

Fig. 15

b) The upper display will show "O6.ñA", the lower display will show "Lr" while the middle display will show the actual zero offset in counts (a number from 0 to 5000).

c) Using ▲ or ▼ push-button, adjust the instrument output until 0.000 mA ±0.005 mA is shown by the calibrator.

d) After a few seconds, start the calibration by pushing FUNC push-button. At the end of this calibration routine, the instrument will go to the next step.

12.2) "Hr" - FINAL SCALE VALUE

The upper display will show "O6.ñA", the lower display will show "Hr" while the middle display will show the actual full scale offset in counts (a number from 0 to 5000).

a) Using ▲ or ▼ push-buttons, adjust the instrument output until 20.000 mA ±0.005 mA is shown by the calibrator.

b) After a few seconds, start the calibration by pushing FUNC push-button. At the end of this calibration routine, the instrument will go to the next step.

12.3) "∀." - OUT 5 CHECK

The upper display will show "O6.ñA", the lower display will show "∀." while the middle display will show a read-out value in counts (a number from 0 to 8000).

a) The instrument shows a value equal to 4000 count. The calibrator measure must be equal to 10.000 mA ± 0.005 mA

NOTE: when it is desired to use a different check point, the following formula describes the ratio between the signal output and the instrument read-out (in counts).

$$\text{OUT} = \frac{\text{displayed value}}{8000} \bullet 20$$

b) Using ▲ or ▼ push-button, set a value equal to 0 count. The "O6.ñA" "Lr" calibration is correct if the calibrator measure an output equal to 0.000 mA ± 0.005 mA

c) Using ▲ or ▼ push-button, set a value equal to 8000 count. The "O6.ñA" "Hr" calibration is correct if the calibrator measure an output equal to 20.000 mA ± 0.005 mA

d) Push FUNC push-button, the instrument will go to the next calibration group.

12) "CAL" - DEFAULT CALIBRATION PARAMETER LOADING.

The upper display will show "CAL".
The lower display will show "dFLt.".
The middle display will show "OFF".

A complete and consistent set of calibration parameters is memorized in the instrument. These data are theoretical data and are used only to clear all calibration memory but after a default calibration data loading it is necessary to make **all** calibrations.

When you desire to clear all calibration memory proceed as follows:

a) Select the default calibration parameter loading

b) Push ▲ push-button, the middle display will change to "On".

c) Push the "FUNC". The central display will show

LOAd

Then the upper display will show CAL while the lower display will show the firmware version.

The default calibration parameter loading procedure is ended.

WARNING: After default calibration data loading, it is necessary to remake **all** instrument calibrations.

Specifications subjected to change without notice